Report of the Protocol Committee of the

Roanoke River Basin Water Conservation Alliance

Introduction

On 28 January 2003, the Management Objectives committee report was presented to the Water Conservation Alliance (WCA). That report listed the top priorities the WCA should consider in developing a new release protocol for the Leesville Dam and the Smith Mountain Lake Project. As an outcome of this report the Protocol Committee was established to study and develop a new release protocol. This purpose of this report is to detail the efforts of the protocol committee and to report its findings.

Membership

J. Johnson Eller, esq. – Chairman, Altavista, VA
William Brush – member, Smith Mountain Lake, Bedford County, VA
J.T. Davis – member, Friends of the Staunton River, Brookneal, VA
John Lindsey – member, Smith Mountain Lake, Pittsylvania County, VA
Shelton Miles – member, Citizens for Preservation of the River, Long Island, VA
William Reidenbach – member, Smith Mountain Lake, Franklin County, VA
Teresa Rodgers – member, Reservoir Manager, American Electric Power (AEP)

Summary

The committee attempted to establish a protocol for releases that would fairly support all stakeholders needs both above the Leesville Dam (upstream) to below (downstream) the principal idea being to “share the pain” equitably in times of prolonged low inflows. In formulating the protocol principal priorities were:

1. Upstream and downstream public water withdrawals and sewage effluent dispersion;
2. Power generation capability;
3. State agency requirements including: water quality, sustenance of aquatic life, and Striper and other fish species spawns;
4. Downstream and upstream economic, recreational and tourism needs and expectations.

During the course of four meetings, the committee examined several release protocols and studied their impact upon stream flow below the Leesville dam and on the water levels of Smith Mountain Lake. Rather than speculate on potential inflows into the project, the committee utilized historical stream flow data from the United States Geological Survey (USGS), evaporation rates from the Army Corps of Engineers and actual operational data (1998 – 2002) from AEP.

A volumetric analysis was developed in Microsoft Excel that utilized historical inflows to Smith Mountain and Leesville Lakes, postulated possible release protocols from Leesville dam, and projected stream flow for each release protocols at the downstream points of Altavista, Brookneal and Randolph, VA.

Although several protocols were studied, the committee focused upon three:

1. The Shelton Miles Release Protocol, initially suggested in his white paper to the WCA on 29 April 2002;
2. The Graduated Step Release Protocol, developed during this committee's deliberations;
3. The 650cfs protocol currently required by the Federal Energy Regulatory Commission for operation of the Smith Mountain lake Project.

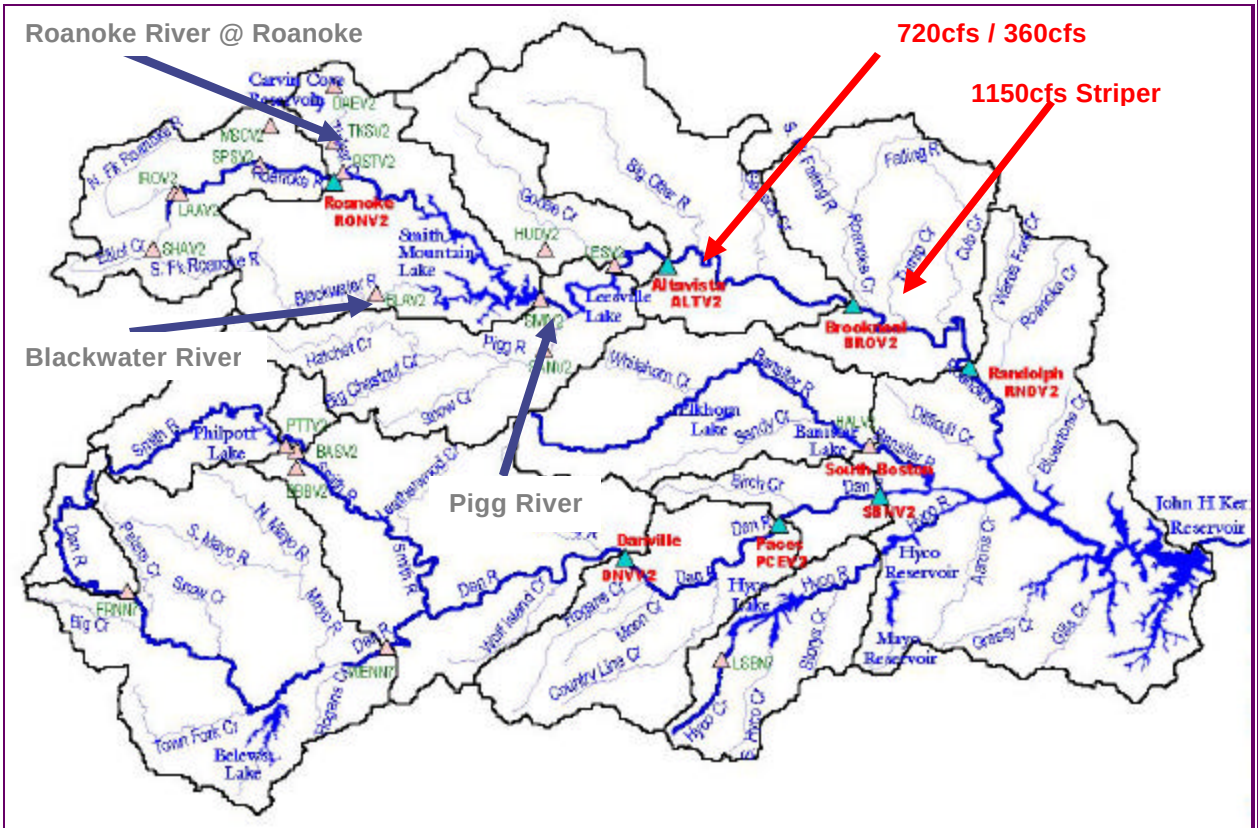
The committee was unable to reach an agreement and recommend a specific protocol. However, several key points of agreement were reached, and these key points should be utilized by the WCA as it continues its work.

The Protocol Committee recommends that any release protocol incorporate the following key points:

1. The current 650cfs protocol is not optimal during times of prolonged low inflows because it results in very low lake levels.
2. The ability of the system operator to generate electrical power must not be compromised.
3. The seasonal nature of stream flow and precipitation must be accommodated.
4. Minimum release rates from Leesville must be sufficient to:
    a. Ensure adequate flow to meet downstream Municipal and Industrial water needs;
    b. Ensure adequate flow to meet DEQ minimum flow by at Altavista to assimilate sewage effluent discharge and to preclude stagnation;
    c. To maintain the temperature and dissolved oxygen levels in the Staunton River within the DGIF stated acceptable parameters to ensure the quality of the water and to protect the fishery and the aquatic life of the river;
5. Minimum release rates from 15 October through 31 March should not fall below 350cfs.
6. Minimum release rates from 31 May through 15 October should not fall below 400cfs.
7. Between February and March the project should "super charge" to 795.3 feet adjusted, to support striper spawn releases
8. During striper spawn, a 30 day period from April through May, release rates should support an 1150cfs flow-by at Brookneal
9. The release regimen must consider: public water withdrawals, rainfall, evaporation rates, stream flow, lake levels, and downstream flow requirements at Altavista and at Brookneal.
10. Upstream and downstream recreational expectations must be fairly balanced.
11. All identifiable stakeholder interests should be represented in the determination to invoke reduced release rates. The decision to invoke the reduced rate flow protocol is made by DEQ, always with stakeholder input and usually with stakeholder consensus.

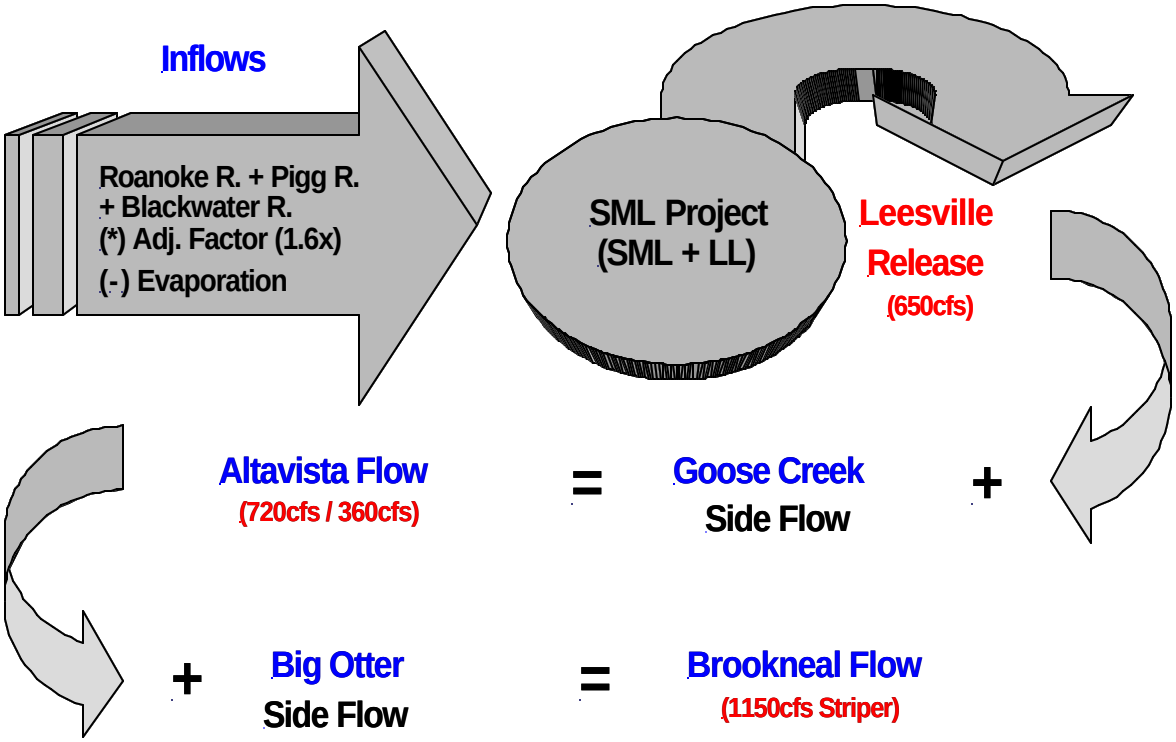
Methodology

The following map of the Roanoke River Basin highlights the major inflows (blue arrows) into the Smith Mountain Project and flow-by requirements (red arrows) at downstream points. The required flow-by at Altavista is 720cfs; except under variance conditions, the flow-by can be reduced to as little as 360cfs. During striper spawn, the flow-by requirement at Brookneal is 1150cfs.



The volumetric model was developed in Microsoft Excel and utilizes measured historical inflows from the Roanoke River, Blackwater River and Pigg River into Smith Mountain and Leesville Lakes. Release rates from Leesville Dam are varied in accordance with the protocol design. The Excel spreadsheet calculates the impact of the release protocol upon lake levels and downstream flow-by requirements at Altavista, Brookneal and Randolph, VA. Using this methodology, the committee was able to evaluate the performance of each proposed protocol under identical conditions. The simple volumetric model is shown below.

Basic Volumetric Model

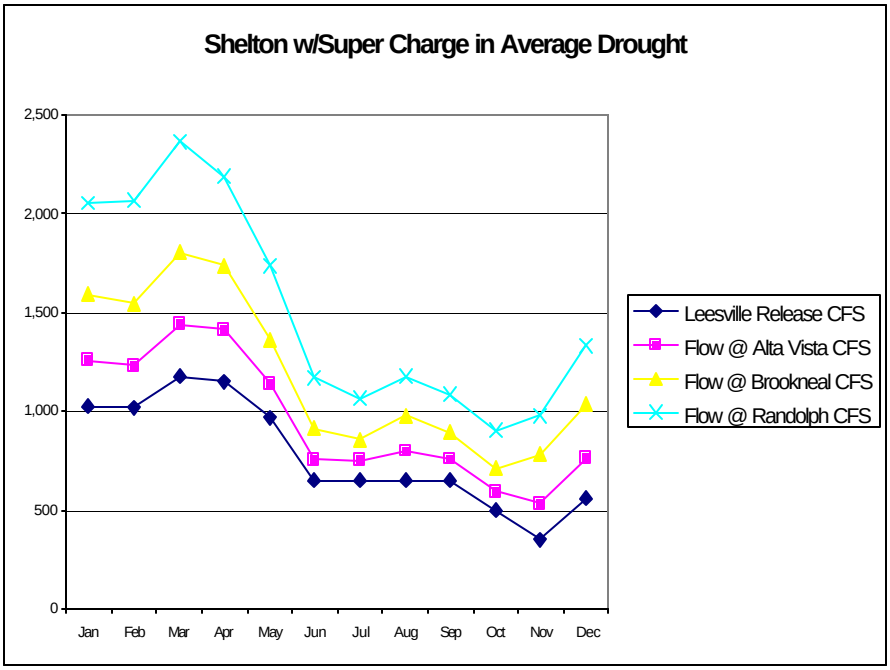


The committee studied three release protocols:

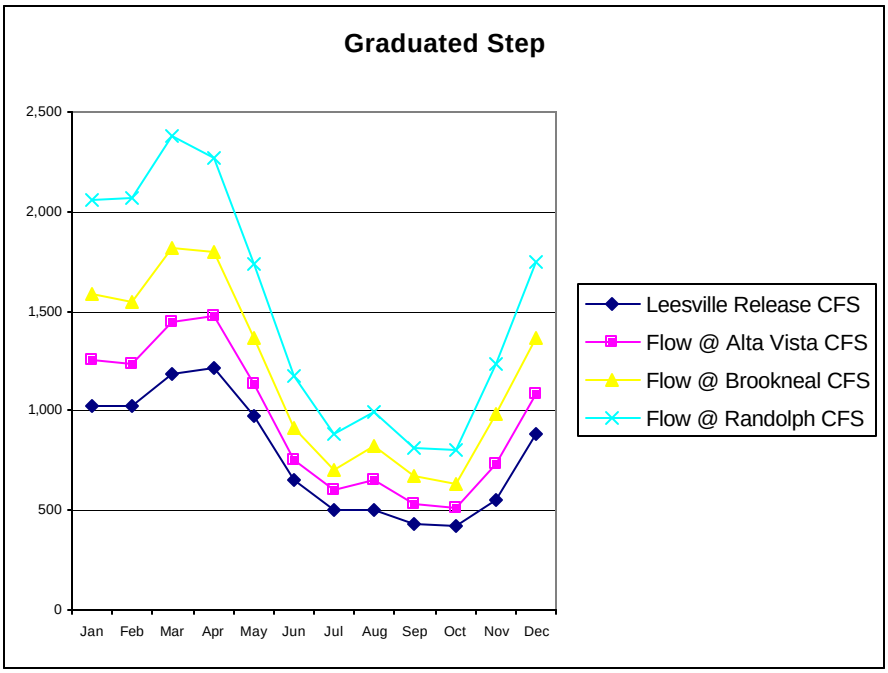
1. The Shelton Miles Release Protocol, initially suggested in his white paper to the WCA on 29 April 2002;
2. The Graduated Step Release Protocol, developed during this committee's deliberations;
3. The 650cfs protocol currently required by the FERC for operation of the Smith Mountain lake Project.

Expected Drought Conditions

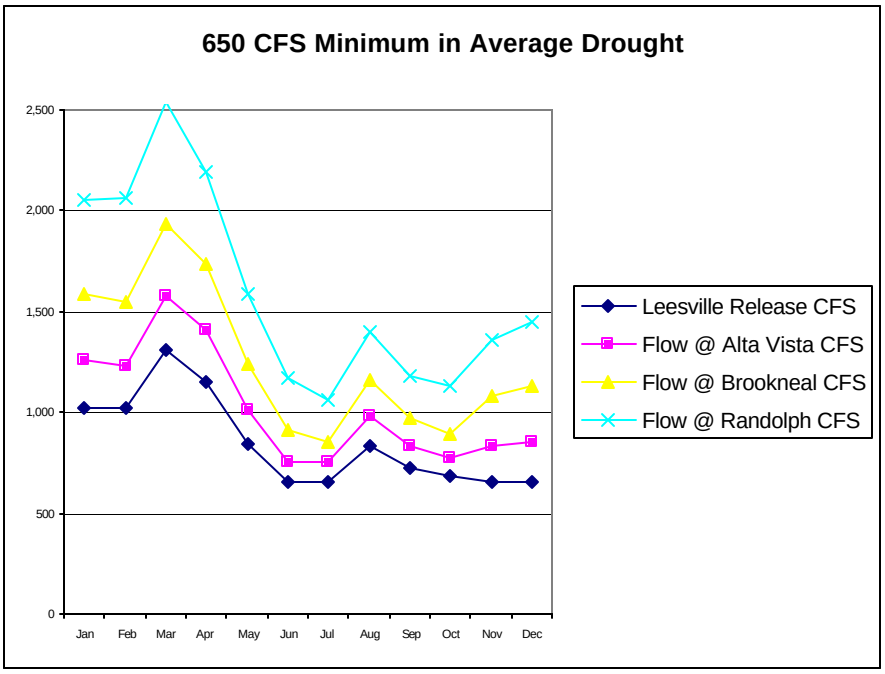
The charts below summarize the performance of each protocol under likely or expected drought conditions. The following charts are based on assumptions and extrapolations as well as hard data and while they were refined many times as a result of committee discussions the published versions are not the product of unanimous agreement.



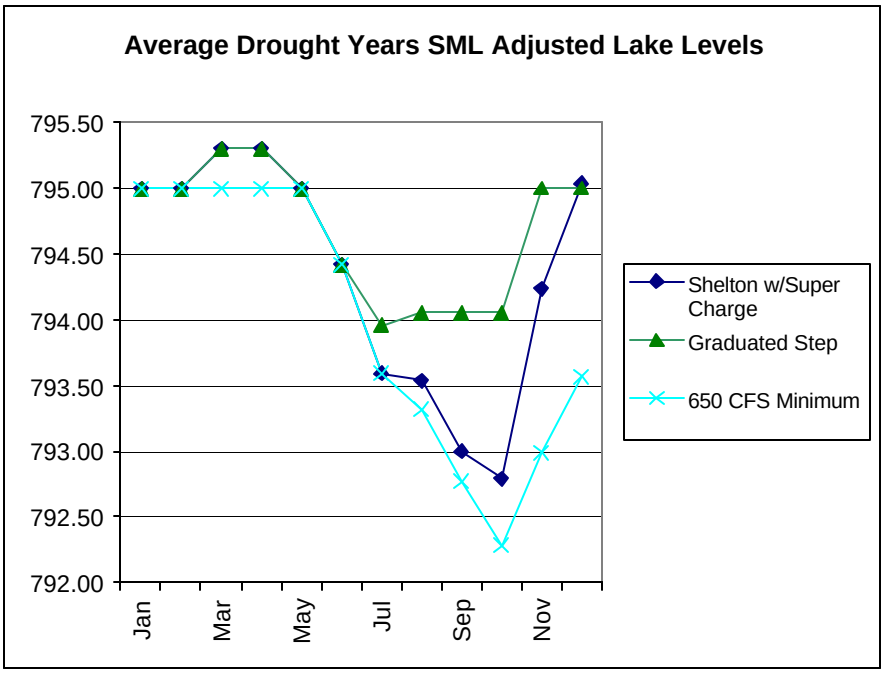
Shelton Miles Protocol Release Rates And Flow By At Downstream Gauges



Graduated Step Protocol Release Rates And Flow By At Downstream Gauges



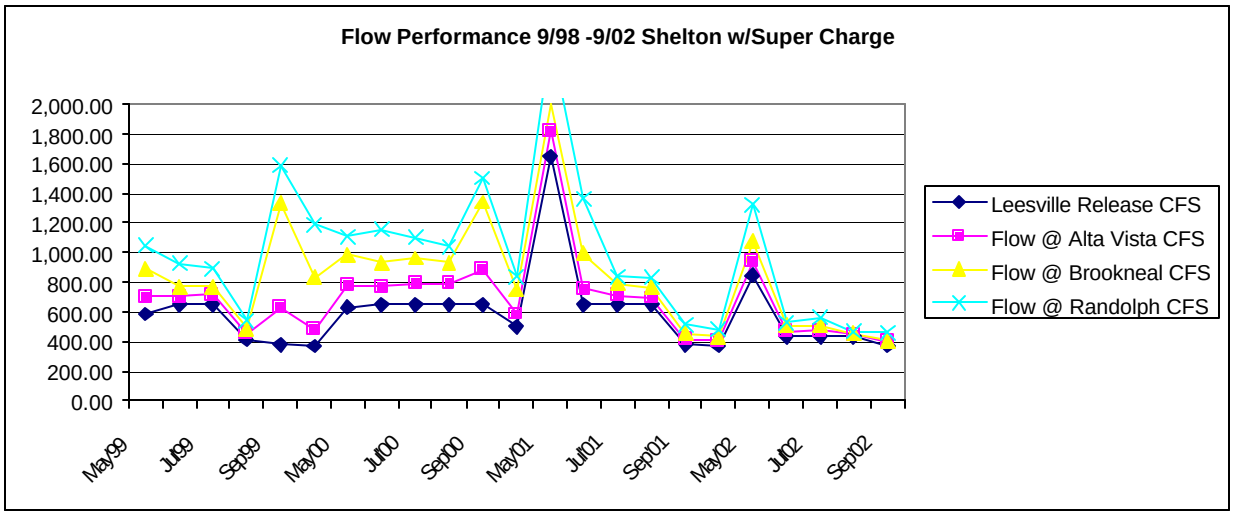
650 CFS Protocol Release Rates And Flow By At Downstream Gauges



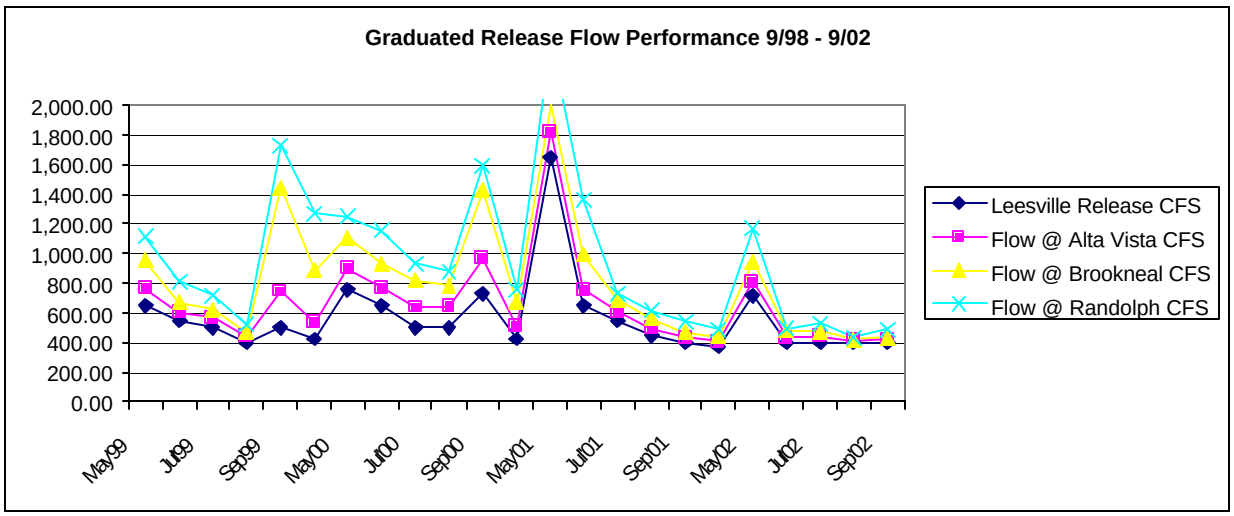
Protocol Performance Relative To Adjusted Lake Level

Actual Conditions 1998 to 2002

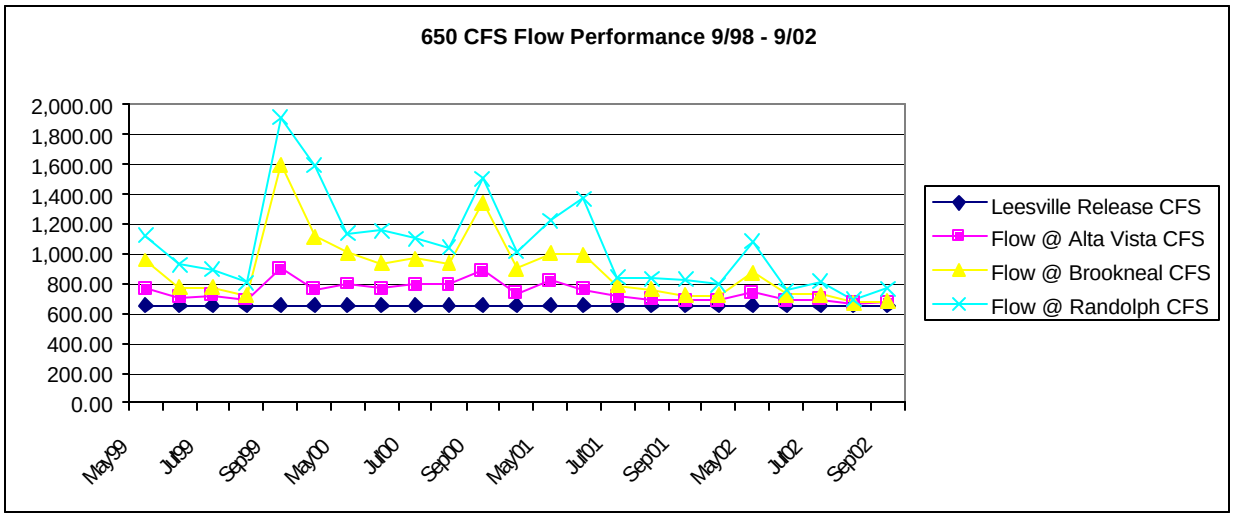
The following charts summarize the performance of each protocol under the actual conditions experienced between September 1998 and September 2002. The following charts are based on assumptions and extrapolations as well as hard data and while they were refined many times as a result of committee discussions the published versions are not the product of unanimous agreement.



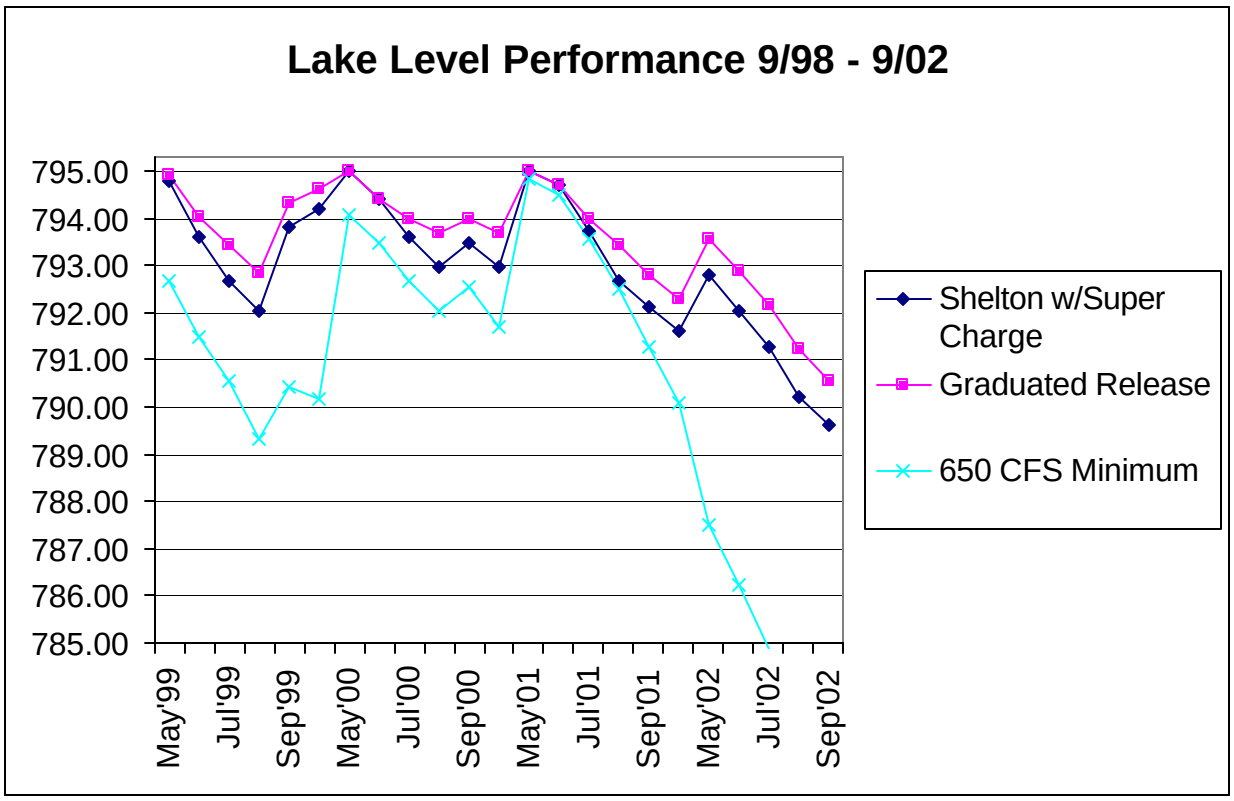
Flow Performance 9/98 – 9/02 Shelton Miles Protocol



Flow Performance 9/98 – 9/02 Graduated Step Protocol



Flow Performance 9/98 – 9/02 650cfs Protocol



Lake Level Performance 9/98 – 9/02 Evaluated Protocols

Conclusions

Areas of Agreement

Several key points of agreement were reached, and these key points should be utilized by the WCA as it continues its work. The Protocol Committee recommends that any release protocol incorporate the following key points:

1. The current 650cfs protocol is not optimal during times of prolonged low inflows because it results in very low lake levels.
2. The ability of the system operator to generate electrical power must not be compromised.
3. The seasonal nature of stream flow and precipitation must be accommodated.
4. Minimum release rates from Leesville must be sufficient to:
    a. Ensure adequate flow to meet downstream Municipal and Industrial water needs;
    b. Ensure adequate flow to meet DEQ minimum flow by at Altavista to assimilate sewage effluent discharge and to preclude stagnation;
    c. To maintain the temperature and dissolved oxygen levels in the Staunton River within the DGIF stated acceptable parameters to ensure the quality of the water and to protect the fishery and the aquatic life of the river;
5. Minimum release rates from 15 October through 31 March should not fall below 350cfs.
6. Minimum release rates from 31 May through 15 October should not fall below 400cfs.
7. Between February and March the project should "super charge" to 795.3 feet adjusted, to support striper spawn releases
8. During striper spawn, a 30 day period from April through May, release rates should support an 1150cfs flow-by at Brookneal
9. The release regimen must consider: public water withdrawals, rainfall, evaporation rates, stream flow, lake levels, and downstream flow requirements at Altavista and at Brookneal.
10. Upstream and downstream recreational expectations must be fairly balanced.
11. All identifiable stakeholder interests should be represented in the determination to invoke reduced release rates. The decision to invoke the reduced rate flow protocol is made by DEQ, always with stakeholder input and usually with stakeholder consensus.

Areas of Disagreement

The committee was unable to reach agreement and recommend a specific protocol. Those specific areas of disagreement follow:

- The specific events which would trigger reduced release rates
- The specific trigger level which would result in reduced release rates

The essence of both the Shelton Miles and Graduated Step Protocols is to conserve the water resource, as much as is reasonably possible, during extended periods of low inflows, to enable the Smith Mountain Project to better support all stakeholders in accordance with the following priorities:

1. Upstream and downstream public water withdrawals and sewage effluent dispersion;
2. Power generation capability;

3. State agency requirements including: water quality, sustenance of aquatic life, and Striper and other fish species spawns;
4. Downstream and upstream economic, recreational and tourism needs and expectations.

Key differences between the Shelton Miles and the Graduated Step Protocols:

- The Graduated Release triggers earlier on prolonged low inflows and project levels and reduces the release rate in two steps: (1) 650cfs to 500cfs and (2) 500cfs to 400cfs, whereas the Shelton Miles protocol delays the variance until the lake levels reach a lower level and then reduces the release rate to 400cfs.
- The Graduated Release recognizes lake navigation and public safety issues when actual lake level falls below 792' and seeks to raise lake levels to return to safe levels faster, whereas the Shelton Miles protocol maintains higher flows in the Staunton River for a longer time before instituting a lower release rate.

Recommendations

The Protocol Committee recommends that the WCA work with AEP & the FERC during the re-licensing of the project, so that a better protocol can be licensed for operation. To achieve this objective the committee also encourages the WCA to participate in developing studies that need to be accomplished during project re-licensing. Lastly, this committee recommends that when opportunity presents it self, the release protocol should be tested and evaluated during the period leading to relicensing. A mechanism to optimize the release protocol, based upon conditions and experience, should be included in the new license.

Appendix A--Shelton Miles Protocol

Winter (15-October 16-January): Restore Full Pond

- Drop releases to as little as 350 cfs (or alternatively, to maintain 360 cfs @ Altavista Gage/550 cfs @ Randolph).
- Releases should be "ratcheted" upward or downward to mimic natural rises & falls in river elevations, and in accordance with severity of the lake shortfall/inflows.

Spring (February-Striper Spawn Beginning): Supercharge Above Full Pond (795.3').

- If we are in a drought of over 60 days duration, with inflows below 525 cfs, then winter discharge criteria should be followed.
- If project is @ 794.5 or above, and inflows> 525 cfs, then releases of 525 cfs.

Striper Spawn: 1100 cfs @ Brookneal Gage for 45 days

- If Smith Mountain Lake is 794.5' at beginning, with previous 30 day inflows averaging 525 cfs, or above. If these criteria are not met, then some semblance of striper spawn, which allows for lake level to drop no lower than 792.8'.

Summer (End of striper spawn through October 15): (Temperature adjustments if necessary).

Early Summer (end of spawn-July 5)

- If SML @ <793' and average inflows less than 350 cfs over previous 30 days, or lake level <792.5' triggers release of 400 cfs with weekend daylight Long Island river 650 cfs releases (Saturday only if lake level is not recovering).

Mid Summer: (July 6-Labor Day)

- Adjusted lake level below <792.5' and 30 day average inflows less than 400 cfs, or lake level <792', triggers release of 400 cfs with Saturday only river recreational releases.

Late Summer (Day after Labor Day-October 15)

- Adjusted lake level below 792.5' triggers release of 400 cfs through September 15; 350 cfs for balance of period. No recreational releases below 792'; above 792' only as level is recovering.

Appendix B -- Graduated Step Release Protocol, 11 Sept 2003 Version

Objective: Restore Full Pond
Winter (15 October to 1 March)

- If project adjusted lake level is less than 795', drop releases to 350cfs (or alternatively to maintain 360cfs @ Altavista Gage). Use any surplus flow above 350cfs to recharge the project to full pond.

Objective: Super-Charge Project to 795.3' to Support Striper Spawn
Spring (1 March to Striper Spawn Beginning)

- If project adjusted lake level is greater than 794.5', with inflows greater than 525cfs for the previous 30 days, then release 525cfs until super-charge is met. Once super-charge is reached, any surplus flow above 525cfs is released.
- If project adjusted lake level is less than or equal to 794.5' with inflows less than 525cfs for the previous 30 days, then release 350cfs until super-charge is met. Once super-charge is reached, any surplus flow above 350cfs is released.
- If either of the above conditions are not satisfied, then release 350cfs until supercharge is met. Once super-charge is reached, any surplus flow above 350cfs is released.

Objective: Support Striper Spawn
Late Spring (15 April to 30 May)

- If project adjusted lake level is greater than or equal to 794.5' at the beginning of spawn, with previous 30 day inflows averaging equal to or greater than 525cfs, release 650cfs for 30 day striper spawn. Any surplus flow above 650cfs is released.
- If these criteria are not met, then DEQ initiates telephone conference call. Data supports suggested release 525cfs for 30 day striper spawn. Any surplus flow above 525cfs is released.

Objective: Support River and Lake Recreation
Summer (End of striper spawn through October 15)

- If project adjusted lake level is greater than or equal to 794' (release 650cfs; use any surplus flow above 650cfs to recharge the project to 795' adjusted.
- If project adjusted lake level is less than 794', with inflows averaging 400cfs or less over the past 30 days, and SML level is greater than 792' actual, release 500cfs average (650cfs night-time/350cfs day-time) to provide daylight river canoeing 7 days per week; use any surplus flow above average 500cfs to recharge project to 794' adjusted.
- If project adjusted lake level is less than 794', and SML level is less than 792' actual, then release 433cfs average (650cfs night-time/400cfs day-time for two days each weekend) to recharge SML actual level to 792'. Provide two 12 hour weekend release periods of 650cfs for downstream recreation.

Any stakeholders can request DEQ to initiate a telecon to review any stakeholder concern at anytime.